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sumption that large expenditures for administration must follow from their management appears gratuitous, and the charge that they may crush out the public spirit of the Laboratory is not warranted by any facts made public.

A geophysical laboratory, as an object of investment on the part of the Carnegie Institution, does not commend itself to the judgment of the editor, but a laboratory for psychology does. Will I be understood if I plead inability to render an unbiased opinion in a case where my interests as a geologist are so nearly concerned?

The establishment of a board of managers consisting of twenty eminent scientists, as suggested by the Editor of SCIENCE, is a feature of a plan which perhaps should be discussed as a whole if at all; but with regard to such a board it may be suggested that it will in time develop, if it is needed, from the cooperative relations of the special scientific committees. And until the obvious need leads to evolution of additional organs, those which the Carnegie Institution now has may well be allowed to demonstrate their fitness to accomplish the ends of its generous founder.

BAILEY WILLIS.

LAMPASAS, TEXAS,
September 23, 1902.

SCIENTIFIC BOOKS.

Bibliography and Catalogue of the Fossil Vertebrata of North America. (To the end of the year 1900.) By OLIVER PERRY HAY. Bull. U. S. Geol. Surv., No. 179, pp. 868, 1902.

The present volume represents several years' diligent work on the part of a writer who has faced the hapless task of unraveling the literature of American fossil vertebrates. Of course such a task is by no means that of such a Hercules as C. Davies Sherborn, who is indexing no less than *all species of animals*; but I fancy it has been found tedious enough. It is missionary work certainly, and its author

deserves the gratitude of paleontologists, who would otherwise have had to have searched through 667 references for a species of Cope's, 225 for one of Marsh's, 221 for one of Leidy's. And the reviewer speaks feelingly, for he has occupied himself *en amateur* in a far smaller bibliographical study during the past half-dozen years, and can picture better than a layman the roomful of closely written cards which the author must have accumulated, and the mere physical labor of hunting up, handling and thumbing a mass of books which if put on a single shelf would extend over a mile. Dr. Hay has not merely ransacked libraries to complete the bibliographical writings of all authors who have meddled with American fossil vertebrates, but he has aimed to introduce a complete list of the anatomical and embryological references which bore upon the theme in hand. Then he has picked out the species and fitted them together in systematic arrangement, and finally made the names accessible by means of an elaborate index.

Before criticizing such a work as this, one must evidently bear in mind that absolute accuracy or completeness cannot be hoped for. Oversights, omissions and even proof errors are inevitable, and a fair critic, appreciating the volume's general tone of painstaking accuracy, cannot but feel that it deserves good wishes and scant blame. Its bad mistakes are rare, but minor omissions, points of disagreement and small errors are not uncommon. Its greatest defect is in the matter of cross-references to paleontology which occur in embryological and anatomical papers,—a defect which, however, would be naturally expected in a work of this kind. Its bibliographical lists, on the other hand, are generally accurate and well chosen, and are so complete indeed that one regrets that they are not perfect. Running over the names with which I am most familiar I find, for example, such omissions as these: *A. A. Wright*, a '97 *Dinichthys* paper; *Keyes*, Geology of Polk County ('97 Report of Iowa Geol. Survey); *Emerson*, Geology of Old Homestead County, Mass.; *Vaughan*, Geology of N. W. Louisiana; *Redlich*, on *Ptychodus*; *Seely*, on *Ceratodus*; *Dollo*, on *Lepidosteus*; *Leydig*, on *Koprolithen* u.

Urolithen; *Scupin*, important reference to Rhynchodont dentition; *Manigault*, on the source of the S. C. phosphate deposits; and a number of omitted references in the case of such authors as *Priem*, *Rohon*, *Sauvage* (of this author no titles given after '88), *Traquair* and *Smith Woodward*. And so on through the book, doubtless, if a critic chooses to use a microscope. I note, by the way, no reference at all to the Devonian 'lamprey' *Palæospondylus*, upon which much has been written during the past decade. Probably this omission is due to the absence of this vertebrate in American localities, a reason which would be valid, even in the case of so interesting a form, had the author not repeatedly violated his rule and given prominent reference to such exotics as *Archæopteryx*, *Pareiosaurus* and monotremes. Also there is no reference to conodonts, which are surely American enough, but omitted, doubtless, on account of their questionable kinship to vertebrates. Certainly they at least deserve mention, since some of them, as Hinde has shown, are strikingly similar in structure to the dental cusps of hag-fishes.

Dr. Hay has of course made a number of name changes on the score of priority, a result which was to be expected and dreaded in such a work, for it is a sad trial to have a long-known friendly name whisked away and a strange one, archaic, often intrinsically objectionable, substituted. Sometimes, though, we have to be grateful for an accustomed name even in bad Greek or misspelled, and the purists' use of *Lepisosteus* and *Crocodylus* is the smaller thorn in our flesh. I think, however, that Dr. Hay has overdone the matter in certain cases, for my feeling is that the community at large will resist any name-change where there is the slightest chance of mistaken identity, or where an older group-name is made useful only by torturing its definition into shapes which its author never dreamed of. As a pertinent example of a change of the former kind take the use of *Acanthoëssus* for the well-known paleozoic shark *Acanthodes*. Both are names given by Louis Agassiz, who, having received better material, rejected *Acanthoëssus*, which may have been based upon congen-

eric specimens: but as Agassiz, who was in a position to decide the matter, does not assure us that the forms were the same, I can see no adequate reason for resurrecting the earlier name, especially since the types of *Acanthoëssus* are lost! As an example of a change of the latter class observe the dilatation of Cope's order of sharks, Ichthyotomi, so as to include the cladodont sharks of Ohio (*Pleuropterygii*). Now as a matter of fact this term, even in its restricted sense, can be used only by twisting the definition heroically, for, as many know, it was based upon some Permian shark heads in which Cope mistook artifacts for separate bones, and his definition of Ichthyotomi has in consequence been found to be erroneous on every count; but as it happened that the sharks in question were Pleuracanth, well known in the Permian of Europe, there gradually filtered into the collapsed definition the facts of Pleuracanth vertebral column and fins—but no facts or modifications which could warrant placing within this group the cladoselachian sharks when later these became structurally known. In this connection I may note that Claypole's Ohio '*Cladodus*' is the same as *Cladoselache*, for although Claypole did not give reasons for his position, he failed to acknowledge the validity of the newer genus. So it comes about that Dr. Hay has one half of the Pleuropterygians arranged under one order and the other half under another. A second instance of the use of a term insufficiently defined to be of legitimate value is the resurrected *Aspidoganoidei* of Gill. On the other hand, in creating a new group-term, *Aristoselachii*, it seems to me that Dr. Hay does not practice what he preaches in this very matter of priority. For this term includes precisely the forms for which *Selacha* was used by Bonaparte about 1840. Another inconsistency is in his use of *Pisces* for fishes not including sharks, rays and chimæroids: for this rather startling use of the term he cites as authority the X. éd. of Linné, but I fancy that priority itself does not require us to hold fast to this misconception of Linné for since the time of Aristotle or even Ray and Artedi, the term *Pisces* has just about the same meaning in which it is accepted to-day.

But the especial inconsistency is this: if Dr. Hay wishes to use Linné's *Pisces* so as to exclude the sharks, why has he the right to put back into this term of Linné such forms as sturgeons, anglers, sea-porcupines, pipe-fishes and the like, which Linné himself cast out with the sharks? If this can be done, evidently the sharks also can be restored, and *Pisces* reacquires its normal use.

The present volume touches upon a number of points in which judgments may differ—when one author treads perilously near another's vagaries. Thus I note that Dr. Hay has no scruples in associating such obscure forms as Coccoosteans and Pteraspids with true fishes (while ejecting sharks!). Also that the Arthrodiran Placoderms are still grouped with the lung-fishes, as also for the first time are Pterichthyids—and for the latter annexation no reasons are given. These forms are altogether grouped as Azygostei, a new subclass, equivalent to Teleostomi, based doubtless on the presence of a median row of cranial bones; in this event it is evidently a *nomen delendum*, for a similar row of bones occurs admirably in Teleostomes, *Acipenser*, for example. Within the latter subclass the use of Rhipidistia, p. 357, as a superorder equivalent to Crossopterygii, is evidently an oversight.

On all scores, though, returning to our original text, Dr. Hay's volume is a mine of gold to the paleontologist, and the officials of the Geological Survey are to be congratulated on having secured it and given it publication. Such works cannot be too plentiful or too welcome. In another case, however, the publishing authorities would add a helpful favor to specialists if they gave the book a wider margin—say, of two inches at the bottom of the page—so as to facilitate the insertion of addenda and corrigenda.

BASHFORD DEAN.

Neurological Technique. By IRVING HARDESTY, Ph.D. University of Chicago Press, 1902. Pp. 185; 4 figures.

Professor Henry H. Donaldson, in his short introduction to this little volume, states that its object is to serve as an introduction and laboratory guide to the study of the architec-

ture of the nervous system. The material considered falls into three divisions: (1) Laboratory methods; (2) an outline for the examination of the central nervous system; (3) a classified list of the neurological nomenclature (B N A) accepted by the German Anatomical Society.

Excellent judgment has been shown in the selection of the laboratory methods, and care has been exercised to bring to the notice of the student only such methods as may be employed with some assurance of obtaining satisfactory results. In case a number of methods are at hand, which bring out, differentially stained, certain elementary constituents of the central nervous system, only the most important are considered or several methods are combined into one workable method, thus avoiding confusion and, at the same time, enabling a student to employ his time most economically. The methods selected are given in full. The descriptive account of each method is prefaced by a statement in which are enumerated the reagents which will be required in each step of the method and in the descriptive account each reagent used and the time during which it should act are printed in heavy type. The student may thus at a glance ascertain the steps of a method. This portion of the volume, while compiled primarily for the beginner, will prove of service to the investigator and teacher as presenting in compact form the essentials of neurological technique.

In the outline for the dissection of the central nervous system, the (B N A) nomenclature is used almost exclusively. This outline is based on the human central nervous system and consideration is given only to the macroscopic anatomy of the organ; with the exception of certain external features, it may, however, be used for the study of the nervous system of the larger mammals. The outline presupposes that the brain and cord used have been fixed in formalin, and that only one specimen is at the disposal of the student. Attention is drawn to the external features of each region, after which the student is directed to make sections along certain planes located by surface markings, each section thus obtained being considered seriatim. A number of fig-